WASHINGTON
SCIENCE TRENDS

HIGHLIGHTS

- ELECTRONIC DATA PROCESSING (A Special Report)
- RESEARCH CHECKLIST
- PUBLICATION CHECKLIST

Vol. IV, No. 23 August 22, 1960

ELECTRONIC DATA PROCESSING

The continuing growth of electronic data processing in American industry carries with it many implications for both management and employees. To determine the impact of office automation the Bureau of Labor Statistics, U. S. Department of Labor, has surveyed 20 offices in private industry which have installed large-scale electronic computers for processing business data.

Here is a summary and outline of major findings which may be applicable elsewhere:

ø Management Objectives

The introduction of a large scale electronic computer increased data-processing capacity and provided a means of achieving significant operating savings on a variety of large-scale routine activities such as payroll preparation and billing. These savings generally resulted not only in a larger clerical output with the same or fewer employees--a major objective--but also economies in processing time, space, and equipment, and greater accuracy. Moreover, some offices were able to process data for management decisionmaking that were previously uneconomical to collect. This new information increased the clerical workload. But, by extending management's control over inventory, other operations and conditions, the acquisition of such data also opened up the possibility of achieving savings in non-clerical activities.

ø Personnel Planning for Transition

The installation of a new computer involved a sequence of administrative, technical, and personnel changes that, on the average, spanned nearly 3 years. This long preparatory period was particularly useful in avoiding extensive dislocation of employees. During this preliminary period, most of the offices studied informed employees about prospective changes, assured those affected of job security, and curtailed hiring to fill vacancies. In the seven offices where employees were organized, existing contracts provided machinery for employee notification and the application of seniority rules in displacement and transfer. A few of the contracts contained provisions regarding consultation, training, and severance benefits.

ø Creation of New Jobs

A small number of new positions were created to operate, program, and manage electronic data-processing activities. An average of 29 persons was employed in these units at the time of the study. Close to 7 out of 10 persons in electronic data-processing work were in programming and planning positions, about a quarter were engaged in operating the equipment, and 8 percent of the group were in administrative and supervisory positions.

ELECTRONIC DATA PROCESSING (Continued)

ø Extent of Displacement and Reassignment

Within 1 year after the installation of the computer, about one-third of the approximately 2,800 employees in units whose work was directly affected had been reassigned to other positions, either within the same unit or elsewhere in the office. A majority remained in the same position. Close to one-sixth had quit, retired, died, or had taken leave of absence. Only 9 persons had been laid off. Altogether, employment in the affected unit had been reduced by about 25 percent at the end of the year.

A little over 80 percent of the employees affected by the change were in jobs involving posting, checking and maintaining records, filing, computing, or tabulating, keypunch, and related machine operations. Most of the remainder were in administrative, supervisory, and accounting work. Only a little over 4 percent were engaged in the less routine clerical jobs such as correspondence, stenographic, and secretarial work.

About two-thirds of those workers still employed in the offices 1 year after the installation continued to do the same type of work. Only about 16 percent of this group were shifted to a different type of work, e.g., from posting and checking to computing. A little under 2 percent, a total of 52 persons, most of whom had been doing administrative, accounting, or tabulating machine work, were transferred from the affected group to electronic data processing jobs.

Close to one-third of the employees in the affected group had been promoted to a higher grade. A negligible number had been downgraded. Most of the upgrading involved employees under age 45 and to some extent reflected promotions which would have taken place regardless of the advent of the new equipment.

The relatively favorable experience of these offices reflected the widespread adoption of policies to provide job security, the continued growth of the clerical workload, and the high rate of labor turnover during a period of prosperity. Since these were large offices, employees could be transferred to comparable clerical positions requiring a relatively short period of on-the-job retraining (with the exception of those assigned to electronic data processing.)

ø Effect on Growth of Office Employment

In the offices studied, the groups directly affected by the introduction of electronic data processing represented, on the average, only about 5 percent of total office employment. Since the companies planned to apply the computers to other activities a larger proportion of office employees will obviously be affected.

Despite the reduction in labor requirements for the tasks performed by the computers, total employment of the offices as a whole rose. Over the 4 years from December 1953 to December 1957, total office employment at 17 of the offices studied increased an average of 7 percent. This increase, however, was less than the 15-percent rise reported for clerical and kindred workers in the Nation as a whole. In 6 of the 17 offices, the increase was greater than 15 percent; in 7, less; and in 4 there was a decrease. Although the immediate effect of electronic data processing suggests some retardation in the growth of office employment, particularly part-time work, the experience of some offices suggests the possibility of expanding employment in new areas of office activity to handle information which had previously been uneconomical to acquire.

ø Change in Grade Structure

The introduction of electronic data processing raised the average grade or skill of office occupations, but only to a slight extent. Routine low paid jobs becoming vacant during the transition period were eliminated, which resulted in the higher paid group making up a larger proportion of the total in the affected group. The classification of electronic data-processing positions at the top of the office pay structure also tended to upgrade the pattern. Since the newly created positions constituted a small proportion of total office employment, however, the net effect on the structure of an entire office was small.

ø Selecting and Training Employees

More than 80 percent of all employees in the new positions were selected from within the offices. Those hired from the outside were primarily trainees. Of the 915 employees in these new positions, only 52, or close to 6 percent, were selected from among employees whose work had been directly affected. Most offices used standard tests of learning ability and numerical aptitude to screen applicants for these positions but based their selection on individual interviews and appraisal.

Typically, the persons selected for programming and planning work, which accounted for the largest group of new positions, were men between the ages of 25 and 34, who had some college education, and who had been engaged in accounting, procedure analysis, or related work. Few women or older workers were chosen for the newly created positions. Four out of five employees assigned to these positions were upgraded. All offices provided at least 4 or 5 weeks of formal classroom instruction for programmers and on-the-job training for operators of the equipment.

ø Some Problems of the Changeover

Although layoffs were averted for all those whose jobs were eliminated, reassigning employees and staffing the new positions sometimes involved complex personnel problems. Finding suitable positions for long-service employees, especially supervisors, without disturbing promotion opportunities of other employees, presented difficulties. Partly because of the newness of the field, establishing salary levels for the new jobs and interpreting tests for selecting staff caused some uncertainty. In unionized offices, there were sometimes prolonged negotiations over which, if any, of the new positions would be within the collective bargaining unit.

ø Implications for Older Employees

Older employees were affected by changes in job status to a lesser extent than younger workers. They benefited from general policies assuring job security, seniority provisions in union agreements, and similar protective provisions in agreements. However, they were not promoted to the newly created electronic positions to the same extent as were younger workers, nor were they hired as trainees. Their educational qualifications, employer's opinions, and preexisting hiring practices, as well as their own lack of confidence in their learning capacity, were said to be among the factors retarding their advancement. In the few cases in which they were assigned to computer work a sense of responsibility and their maturity and experience were considered important factors in favor of older employees.

In those instances where employers had formed opinions about the inflexibility or lack of adaptability of older workers, the introduction of electronic data processing may have intensified reluctance to hire or promote them. The examples of the successful performance of older employees in these new positions, however, in the offices studied, reinforce the findings of research workers on the variability in learning capacity at all ages and underscore the importance of individual appraisal of employees in this field as in others.

RESEARCH CHECKLIST

( ) EPOXY CASTING RESIN: A transparent epoxy casting resin has been developed for the Atomic Energy Commission by the Sandia Corp. The resin is "cold shock resistant" and is expected to be of value to production, control and quality assurance groups as well as design engineers who must contend with the effects of severe pressures on many pressure-sensitive electronic devices. The system is optically clear so that encapsulated units can be visually inspected and the electrical properties are of the same high order encountered in conventional rigid systems.

(Report of April, 1960 now available. 34 Pages. $1. Write OTS, U.S. Department of Commerce, Washington 25, D. C. for Pub. SCR -173)

( ) ANALYZING COPOLYMER SYSTEMS: The National Bureau of Standards has developed a rapid, vapor-phase chromatographic method for identifying acrylic polymers and copolymers as well as other resins used for transparent plastic sheets, molding materials, coatings and dental materials. The analysis is said to require relatively inexpensive equipment, needs only a small amount of material and can be readily adapted for different copolymer systems. Immediate quantitative or qualitative analysis is possible by pyrolyzing the materials directly in the chromatograph.

(For Details on Gas Chromatography for Analyzing Copolymer Systems write National Bureau of Standards, Office of Technical Information, Washington 25, D. C.)

( ) FIELD ANAESTHESIA PLANT: A portable anaesthesia plant for use by Army Medical units under combat conditions is scheduled to undergo acceptance and engineering tests within the next few months. The two skid-mounted units are said to be capable of generating 40 pounds of liquid nitrous oxide per hour and minimize, if not eliminate, the shipping of returnable cylinders of compressed gas to and from various theaters of operation.

(R&D by the Lummus Co., Newark, N. J. for U. S. Army Engineer Research and Development Laboratories, Ft. Belvoir, Va.)

( ) THERMAL METHODS OF OIL RECOVERY: The U. S. Bureau of Mines believes that a substantial increase in the Nation's recoverable oil reserves could be brought about through development of so-called "thermal" or in-situ combustion techniques. The process involves igniting part of the oil in an underground reservoir, usually with an electrical device lowered into a well. The resulting fire, supported by air pumped into the well, thins the oil and helps drive it toward a producing well through which it is drawn to the surface.

(A bibliography listing domestic patents and technical articles on the thermal recovery process is now available. 20 Cents. Write Superintendent of Documents, Government Printing Office, Washington 25, D.C. for Inf. Circular 7958 -- Bibliography of Thermal Methods of Oil Recovery)

( ) PLASMA RADAR DETECTOR: Air Force is currently investigating a novel plasma detector for radars which may replace, or supplement conventional crystal units now used. The plasma detector is said to be capable of withstanding high incident power levels which would destroy a standard crystal. The detector is also said to permit more effective range "gating", a technique used to counter effects of jamming. One current problem to be overcome is a relatively high noise figure.

(R&D by S. Herskovitz, Electronics Research Directorate, Air Force Research Division)

( ) OXYGEN FROM DUCKWEED: Duckweed, a green surface-growing plant, is being investigated for the Office of Naval Research as a possible source of oxygen in space cabins and other closed environments. It was calculated that 25 square feet of the plant would supply enough oxygen to support one man, while maintaining carbon dioxide at a reasonable rate. The species can be grown on supporting matrices such as absorbent paper, it was found. A system of small, vertical reinforced paper panels with duckweed growing on both sides of each panel would occupy 75 to 100 cubic feet per man, including light sources and pumping systems.

(R&D by L. Ney and J. Huang, Stanford Research Institute, Menlo Park, California)

( ) COMPUTER-CONTROLLED VEHICLE CHECKOUT: Army Ordnance has developed an automatic vehicle checkout system incorporating an on-line control computer said to prevent unnecessary repairs and rebuilds, while isolating possible sources of trouble before malfunction. Included in the system are a converter for translating transducer voltage responses into digital form; a commutator unit capable of handling 240 separate transducer lines; and interrogation, command input and readout and magnetic tape storage devices. Tested are power pack, main electrical system, auxiliary engine-generator system. Eventually, suspension tests and metal fatigue measurements may be incorporated.

(R&D headed by R. Brachman, A. Chalfin and C. Dobson, U. S. Army Ordnance, Frankford Arsenal, Philadelphia, Pa. Modified control computer developed by Librascope, Glendale, Calif.)

( ) GAGE BLOCK LENGTH MEASUREMENTS: A special-purpose interferometer developed at the National Bureau of Standards for measuring the parallelism of the opposite faces of gage blocks can now be used without modification to compare the lengths of such blocks. The method does not require wringing which can injure surfaces, eliminates corrections for gravitational distortion and does away with thermal disturbances when critical measurements must be made.

(For further information on Gage Block Length Measurements write National Bureau of Standards, Office of Technical Information, Washington 25, D. C.)

( ) PORTABLE AIRCRAFT MAINTENANCE HANGAR: The U. S. Army Quartermaster Corps has developed and is testing a new portable aircraft maintenance hangar supported by air pressure and a lightweight pre-stressed steel frame. Either end of the shelter can be opened in accordion fashion, eliminating door hazards and reducing wind load encountered by flat surfaces. A 1½ horsepower, high-volume, low pressure blower inflates and stabilizes the neoprene-coated nylon fabric "skin."

PUBLICATION CHECKLIST

- ☐ DRILLING FOR URANIUM, a new report on drilling methods used by commercial firms in exploring for uranium in Western states. Discusses the practices and equipment employed by various drill crews under a wide variety of conditions, and contains detailed information on the costs of uranium exploration in the area. 45 cents. (Write Superintendent of Documents, Government Printing Office, Washington 25, D. C. for U. S. Bureau of Mines Information Circular No. 7944)

- ☐ CONTROL OF ELECTRICAL SHOCK HAZARDS, the first of a new series of bulletins dealing with physical and mechanical hazards in industry. This publication covers typical electrical shock hazards; methods of controlling hazards, and similar information. Single Copies Free. (Write Bureau of Labor Standards, U. S. Department of Labor, Washington 25, D. C. for Bulletin No. 216)

- ☐ GEODESY FOR THE LAYMAN, a simplified study by the Air Force of the basic principles of geodesy and geodetic surveying. Includes diagrams, maps and full-color illustrations. 83 Pages. $2.25. (Write OTS, U. S. Department of Commerce, Washington 25, D. C. for PB 161 372)

- ☐ NUCLEAR ENERGY COURSES, a guide covering the 1960-1961 academic session, providing details of training sources in nuclear energy subjects in some 170 Western European universities, technical high schools and research centers. Single Copies Free. (Write O.E.E.C., European Nuclear Energy Agency, 38 Boulevard Suchet, Paris 16, France for "Catalogue of Courses on Nuclear Energy."

- ☐ SONIC TECHNIQUES, a bulletin evaluating progress in attempts to determine whether sonic techniques can be applied successfully to determine hidden uncomformities in coal mine roof strata. 15 Pages. Single Copies Free. Write Publication Distribution Section, U. S. Bureau of Mines, Pittsburgh 13, Pa. for Report of Investigation No. 5617)

- ☐ DISARMAMENT DEVELOPMENTS, a congressional hearing into recent events in international affairs, relating to atomic weapon tests and disarmament. Includes a detailed comparison of Soviet and Western proposals. 49 Pages. Single Copies Free. (Write Committee on Foreign Relations, U. S. Senate, Washington 25, D. C. for Hearing, Disarmament Developments, Spring 1960)

- ☐ REMOTE CONTROL EQUIPMENT, an Atomic Energy Commission literature search listing 149 references on remote control equipment used in operations that take place under highly radioactive conditions. Most references pertain to equipment used in hot laboratories, but also covered are reactor fuel element handling equipment, nuclear aircraft maintenance equipment and servomechanisms. 20 Pages. 75 cents. (Write OTS, U. S. Department of Commerce, Washington 25, D. C. for TID 3549)

- ☐ TEMPERATURE SCALE, a detailed report on the so-called He^4 Vapor Pressure scale as an international standard for thermometry from 1° to 5.2° K. 17 Pages. 20 cents. (Write Superintendent of Documents, Government Printing Office, Washington 25, D. C. for NBS Monograph No. 10)

- ☐ LARGE RADIATION SOURCES IN INDUSTRY, the first of two volumes of the proceedings of a 1959 International Conference. Emphasizes applications in chemicals, plastics and related fields. Papers are reproduced in language of their presentation, with abstracts in English, French, Russian and Spanish. 478 pages. $4.50. (Write Publication Sales Unit, International Atomic Energy Agency, Kaerntnerring 11, Vienna 1, Austria)